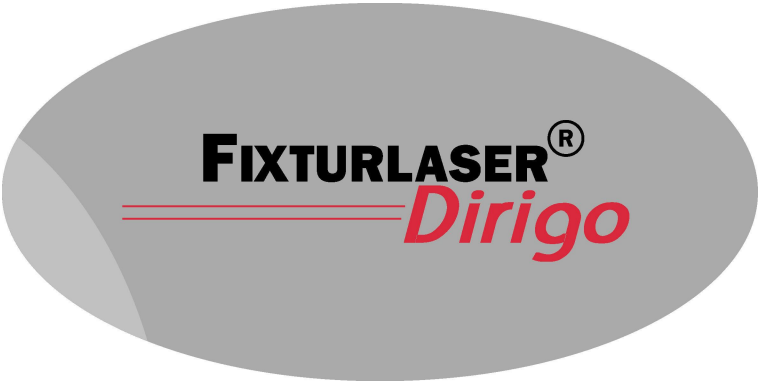


USER'S MANUAL

CONTENT

Content 1
Introduction 5
EU-declaration of conformity 8
Safety and Care 10
Display 12
System Set-up 14
Shaft Alignment 15
Soft foot 26
Limited rotation 28
Tolerance Table 29
Product information 30
Warning Labels 33
Warranty Registration Card 35

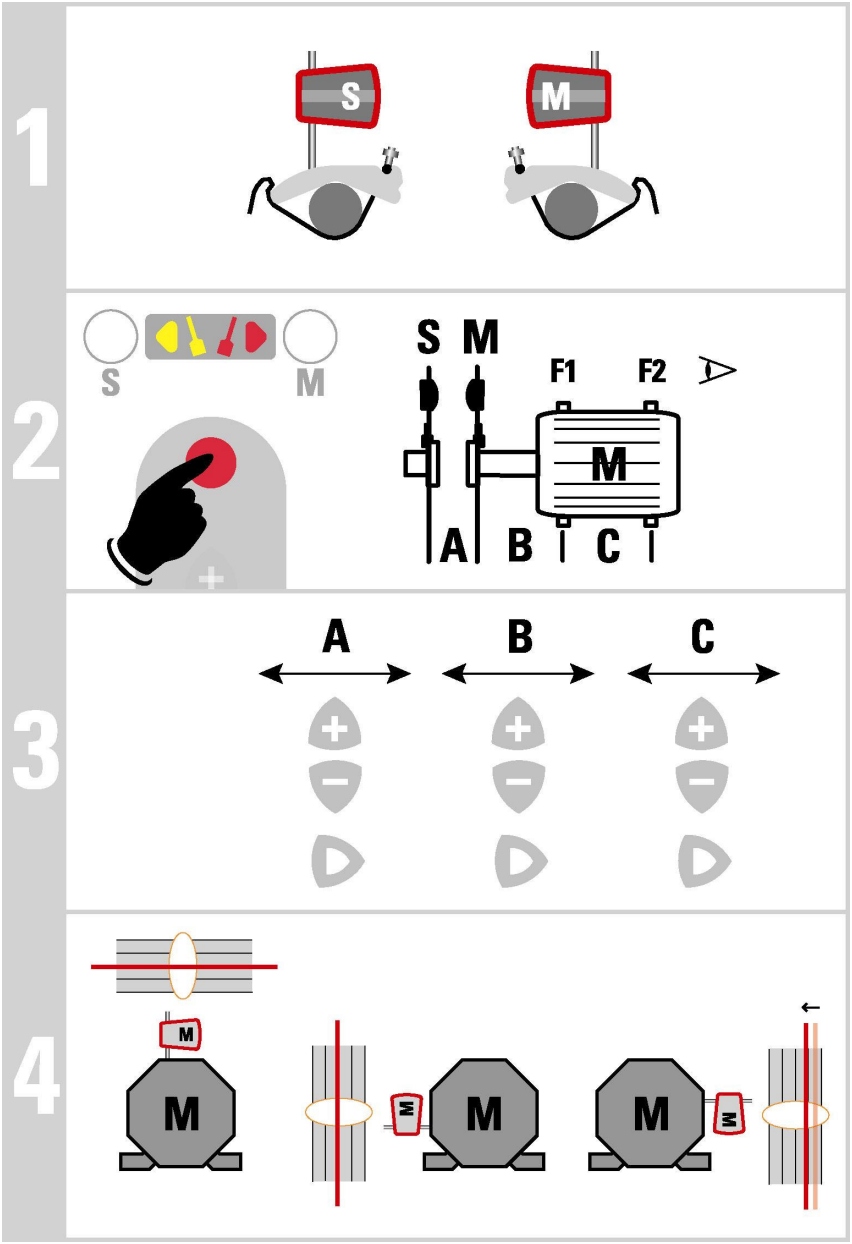
INTRODUCTION

Congratulations to your choice of a Fixturlaser® Dirigo system.

Fixturlaser has since 1984 developed and manufactured laser based alignment and positioning systems for a variety of industrial applications. Our core values, in everything we do, are Fast, Easy & Precise and we hope that this system will fulfill your expectations. We ask you to read the section about safety and care before you proceed with your first measurement.

We wish you many successful measurements.

At next page you will find a Quick Guide for your Shaft Alignment.


1
S
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2
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F1
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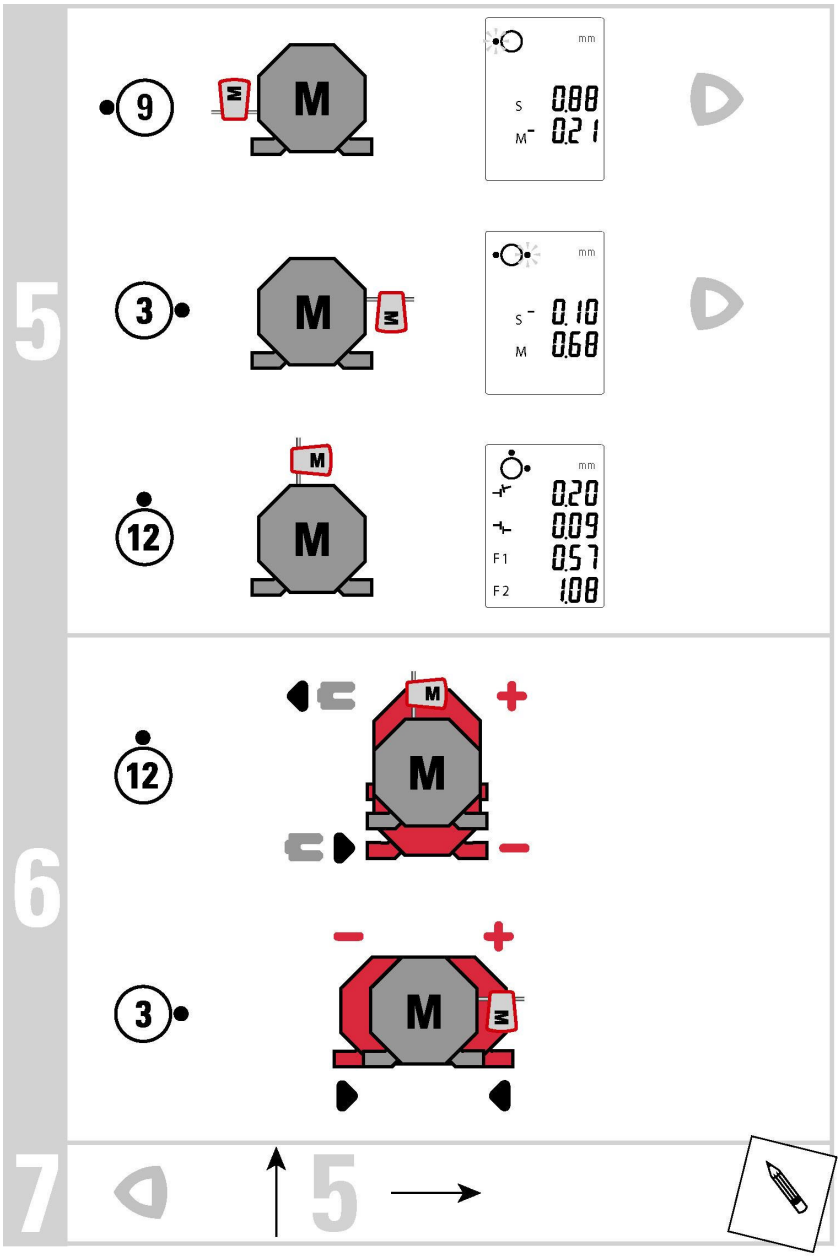
5
9
M
mm
S 0.88
M 0.21
3
M
mm
S 0.10
M 0.68
12
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mm
0.20
0.09
F1 0.57
F2 1.08
6
12
M
M
3
M
M
7
5

EU-DECLARATION OF CONFORMITY

According to

the EMC Directive 89/336/EEC & the Low Voltage Directive 73/23/EEC including amendments by the CE-marking Directive 93/68/EEC

Type of equipment

Alignment System

Brand name or trade mark

Fixturlaser® Dirigo

Type designation(s)/Model no(s)

Fixturlaser® Dirigo 1-0722

Manufacturer's name, address, telephone & fax no

Fixturlaser AB

Box 7

SE-431 21 Mölndal, Sweden

Tel. +46 31 7062800, Fax. +46 31 7062850

Manufacturer's authorized representative within EU (for manufacturers outside EU)

The following standards and /or technical specifications, which comply with good engineering practice in safety matters in force within the EEA, have been applied:

Standard	Test report/ technical construction file/ normative document
EN 61000-6-3: 2001, EN 55011 B	Ref. No/ Issued by: 02091/Fixturlaser AB
EN 61000-6-2: 2001, EN 61000-4-2, -3	Ref. No/ Issued by: 02091/Fixturlaser AB

Additional information

The product is CE-marked in 2005.

As manufacturer/ the manufacturer's authorized representative established within EEA, we declare under our sole responsibility that the equipment follows the provisions of the Directives stated above.

Date and place of issue

Sweden, 2005-01-31

Signature of authorized person

Name & Position

Hans Svensson, Managing Director

SAFETY AND CARE

SAFETY

Always read and follow the operating instructions.

Always turn off the power of the drive machine before you start working and prevent power switch from being accidentally turned on.

Fixturlaser® Dirigo use laser diodes with a power output of < 1,0 mW. The laser classification is Class 2 which is considered safe for its intended use with only minor precautions required. These are:

- **Never stare directly into the laser transmitter.**
- **Never shine the laser directly into anyone else's eyes.**

Do not expose the equipment to rough handling or heavy impacts.

Do not expose the equipment to high humidity or direct contact with water.

Opening the housing of the measuring unit voids warranty and may result in hazardous light exposure.

Opening the display unit voids warranty.

Calibrate the equipment regularly.

All repair work should be taken care of by Fixturlaser's authorized service centres.

Your system complies with the requirements in:

- SS-EN-60825-1-1994
- British Standard BS 4803 Parts 1 to 3
- Deutsche Industrie Norm DIN SEC 76 (CO) 6
- USA FDA Standard 21 CFR, Ch 1, Part 1040.10 and 1040.11

Power Supply

Fixturlaser® Dirigo are powered by two alkaline batteries, size LR 14, in the display unit.

The lifetime of the batteries is approximately 20 hours when the system is used for a typical alignment job. When the power is low a battery replacement warning appears on the screen.

If no button is pressed within 60 minutes, the unit will turn off automatically.

The batteries are replaced by opening the lid on the rear side of the display unit. The batteries should be positioned with the plus pole pointing upwards, as indicated in the battery compartment.

If the system is to be stored for a longer period of time the batteries should be removed to prevent damage.

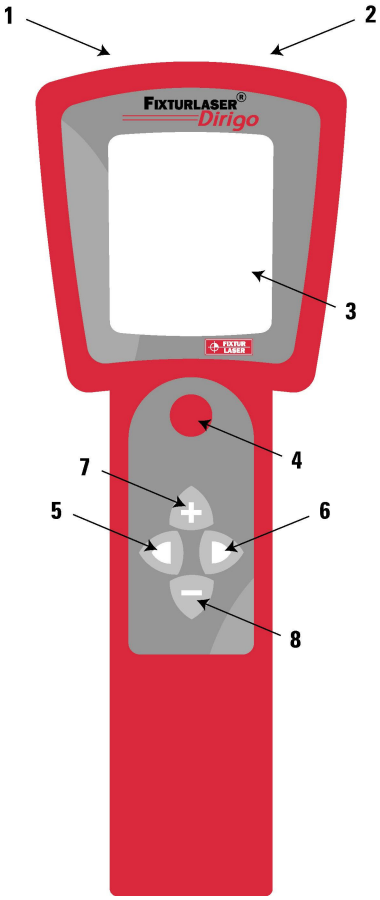
Treatment and Care

The system should be cleaned with a cotton cloth or a cotton bud tipped swab moistened with a mild soap solution with exception for the detector surface, which should be cleaned with alcohol.

Do not use paper tissue, which can scratch the detector surface. For the best possible function, the laser diode apertures, detector surfaces and connector terminals should be kept free of grease or dirt. The display unit should be kept clean and the screen surface protected from scratches.

DISPLAY

Connectors and buttons



1 Connector for TD-S

2 Connector for TD-M

3 LCD display

4 ON/OFF button (red button)

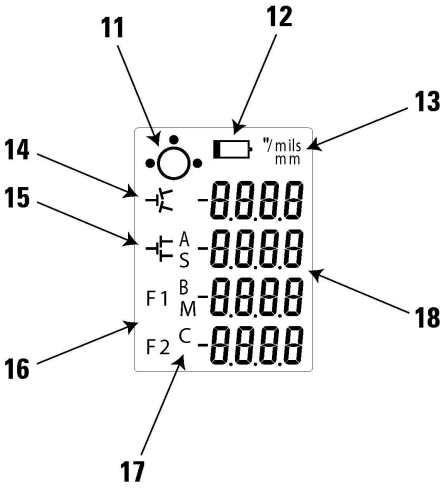
5 PREVIOUS button

6 NEXT button

7 PLUS button (increase / select)

8 MINUS button (decrease / select)

LCD display



11	Position (9/3/12 o'clock) of measuring units	**15**	Indication of parallel misalignment direction
12	Battery low symbol	**16**	Feet (F1, F2)
13	Measurement unit (imperial or metric)	**17**	Distances (A, B, C) / Stationary & Movable (S, M)
14	Indication of angular misalignment direction	**18**	Distances / Measured values

SYSTEM SET-UP

MEASUREMENT UNIT

The measurement unit is pre-selected to mm.

The last setting will always be remembered.

mm To change the measurement unit to mm, press the PLUS button together with the ON button (red button).

inch To change the measurement unit to inch, press the MINUS button together with the ON button (red button).

SHAFT ALIGNMENT

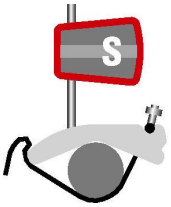
INTRODUCTION

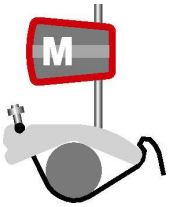
Shaft alignment: Correction of the relative position of two machines that are connected, such as a motor and a pump, so that the centre lines of the shafts form a straight line when the machines are working at normal operating temperature. Shaft alignment means moving the front and rear pair of feet of one machine, vertically and horizontally, until the shafts are aligned to within given tolerances. A tolerance table is available in the manual.

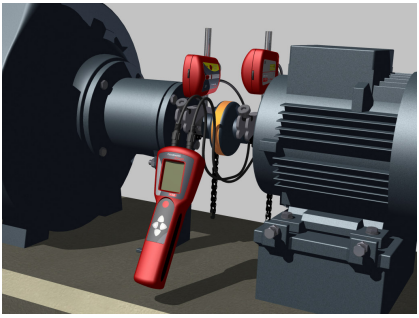
The measurement method is based upon the principle of a reverse indicator alignment system. Instead of steel bars with dials it uses two laser beams. Unlike steel bars the laser beams do not have the disadvantage of sagging and this contributes to the system's high degree of accuracy.

The Fixturlaser® System also has two measurement units but in this case these are electronic targets rather than mechanical dial indicators. These are built in together with the laser transmitter in a pair of units, the Transmitter/Detector units (TD-units). With standard dial measurement techniques the results need to be graphed out manually and calculations are needed to establish the corrections required. With the Fixturlaser® System all this is done automatically. Real time alignment values are displayed as the machine is moved. You can see the effect of tightening a bolt as soon as it happens.

Mounting





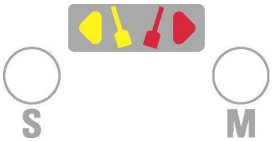


Attach the V-block fixtures on the shafts of the measurement object, one on each side of the coupling. Tighten the tension screws firmly, always using the supplied tool. Do not over-tighten. Mount the rod to the fixture and tighten firmly.

Attach the TD-units on the fixtures. The TD-M should be mounted on the moveable machine and the TD-S on the stationary machine. If the shaft diameter is too large the chains can be extended with the extension chains.

Note! It is recommended to position the measuring units at equal distance from the middle of the coupling.

Connect the cables between the display unit and the TD-units. Make sure that the marking on the cables corresponds to the marking of the terminals on the Display Unit.



The TD-M must be connected to the terminal on the DU that is marked with an M and red colour.

The TD-S must be connected to the terminal on the DU that is marked with an S and yellow colour.

If, for any reason, you detach a cable during measurement you will need to restart the system.

Switch on the System

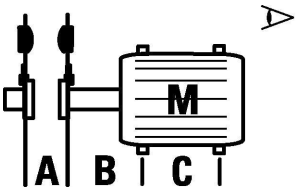
Press the ON button (red button) to switch on the system.

Pre-Alignment

In the efforts to obtain the best possible conditions for a shaft alignment it is necessary to check whether the shafts are bent, the machine base is warped or if there is a soft foot condition.

To check soft foot, see the chapter Soft foot.

MEASUREMENT PROCEDURE



Measure and enter distances

A Measure the distance A, the distance between the two measuring units (measured between the centre marks).

Enter the distance A by using the PLUS and MINUS buttons.

Confirm the distance A by pressing the NEXT button.

B Measure the distance B, the distance between the TD-M-unit and the first bolt centre.

Enter the distance B by using the PLUS and MINUS buttons.

Confirm the distance B by pressing the NEXT button.

C Measure the distance C, the distance between the bolt centres.

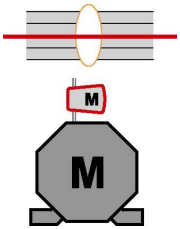
Enter the distance C by using the PLUS and MINUS buttons.

Confirm the distance C by pressing the NEXT button.

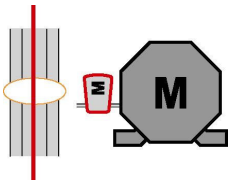
If you need to go back and change values already entered use the PREVIOUS button.

Coarse adjustment

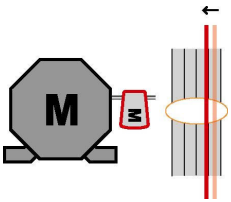
Stand by the machine to be adjusted facing the stationary machine.



Rotate the shafts to the 12 o'clock position, using the spirit levels. Adjust the laser lines to the centre of both targets using the adjustment screws or, if necessary, by moving the measuring units on the rods.



Rotate the shafts to the 9 o'clock position, using the spirit levels. Adjust the laser lines to the centre of both targets using the adjustment screws.

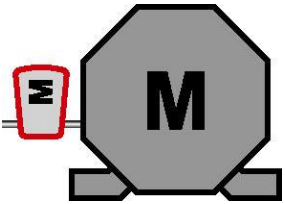


Rotate the shafts to the 3 o'clock position, using the spirit levels. Check that the laser lines hit both of the targets. If not, adjust the laser lines to the position half-way between the centre of the target and the actual position, using the adjustment screws.

When the lasers hit the target in all three measuring positions the measurement point registration can start.

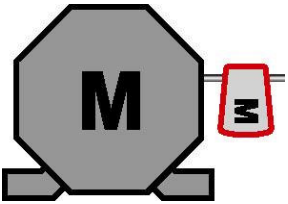
Measurement point registration

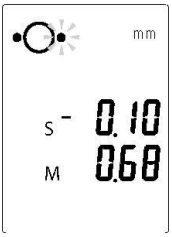
9 Using the spirit levels, rotate the TD-units to the 9 o'clock position. Wait until the TD-values appear.



Confirm the measurement by pressing the NEXT button.

3 Using the spirit levels, rotate the shafts to the 3 o'clock position.

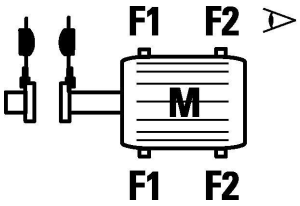




Confirm the measurement by pressing the NEXT button.

Use the PREVIOUS button if you need to go back and repeat any of the measurement steps.

ALIGNMENT

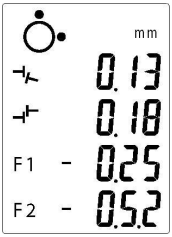


Horizontal Misalignment

After the second measurement at 3 o'clock has been confirmed, the misalignment in horizontal direction is displayed.

The misalignment is shown as coupling values, angle value at the top and offset below.

Feet values are also shown. F1 shows the value for the front pair of feet and F2 the value for the rear pair of feet.

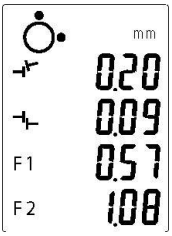


Vertical Misalignment

To see the vertical misalignment, rotate the measuring units to the 12 o'clock position.

The misalignment is shown as coupling values, angle value at the top and offset below.

Feet values are also shown. F1 shows the value for the front pair of feet and F2 the value for the rear pair of feet.



Evaluating Vertical Misalignment

The coupling values, angle and offset, are used to determine the alignment quality. These values are compared to alignment tolerances to determine whether correction is necessary. See machine manufacturer's specified tolerances or the chapter Tolerance Table.

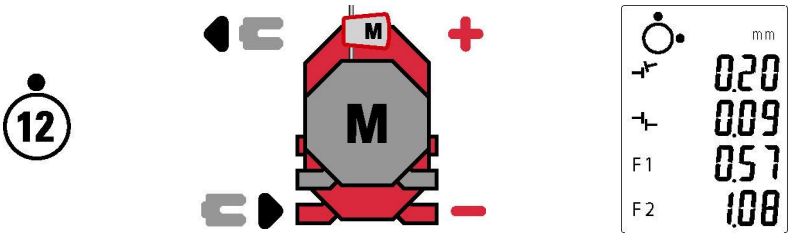
	Positive Angle value		Positive Offset value
	Negative Angle value		Negative Offset value

If the measured coupling values are higher than the acceptable tolerances, vertical alignment is necessary.

If the measured coupling values are within the tolerances, no vertical alignment is needed. Then continue to horizontal alignment.

Vertical Alignment

The feet values give the movable machine's position at the feet where corrections are made.



+	Positive values mean that the machine is high and shims must be removed.
−	Negative values mean that the machine is low and shims must be added.

When the vertical alignment is carried out, continue to horizontal alignment.

Horizontal Misalignment

Rotate the measuring units to the 3 o'clock position to display the misalignment in horizontal direction.

Evaluating Horizontal Misalignment

The coupling values, angle and offset, are used to determine the alignment quality. These values are compared to alignment tolerances to determine whether correction is necessary. See machine manufacturer's specified tolerances or the chapter Tolerance Table.

	Positive Angle value		Positive Offset value
	Negative Angle value		Negative Offset value

If the measured coupling values are higher than the acceptable tolerances, vertical alignment is necessary.

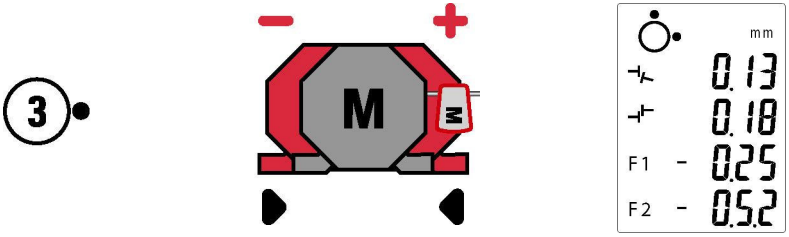
If the measured coupling values are within the tolerances, no horizontal alignment is needed.

Then redo the measurement to confirm the result.

Use the PREVIOUS button to get back to the first measuring step (9 o'clock position).

Horizontal Alignment

The feet values give the movable machine's position at the feet where corrections are made.



+ Positive values mean that the machine is to the right and must be moved to the left.

− Negative values mean that the machine is to the left and must be moved to the right.

If the coupling values both in the vertical and horizontal plane are within the acceptable tolerances the alignment procedure is completed.

Verify Alignment

To confirm the result, redo the measurement.

Use the PREVIOUS button to get back to the first measuring step (9 o'clock position).

Documentation

To document the alignment, write down the measurement result. At the last page of this manual you will find a documentation sheet, that can be copied and used for writing down the result. This documentation sheet can also be downloaded at www.fixturlaser.com.

SOFT FOOT

A soft foot condition needs to be corrected before any alignment takes place. If not, the measurement result will be of no value. It is more or less impossible to establish if there is a soft foot condition without using some kind of measurement tool. With the Fixturlaser® Dirigo System it is possible to check soft foot.

The distances A, B and C have to be entered before checking soft foot.

PROCEDURE

1 Check that all feet bolts are firmly tightened.

2 Press PLUS and MINUS simultaniously to reach the soft foot mode. The text “soft foot” should now be visible on the screen.

3 Position the measuring units in the 12 o’clock position.

4 Press the NEXT button to zero the display values.

5 Loosen one of the bolts and monitor the change of the displayed values.

If the deviation is less than 0.05 mm (2 mils), the foot has a good support. Tighten the bolt and go to the next foot.

If the deviation is larger than 0.05 mm (2 mils), the foot or its diagonally opposed foot is a soft foot. Tighten the bolt and check the diagonally opposed foot. If the deviation is larger than the previously tightened foot, then this is the soft foot. If not, tighten the bolt and go back to the previous diagonally opposed foot. It is normally worthwhile to try to improve the support of the soft foot by adding shims. Add the amount of shims corresponding to the larger deviation measured.

6 Tighten and loosen the bolt once again to check that the deviation does not exceed 0.05 mm (2 mils).

7 Repeat steps 4 to 6 for the remaining feet.

The soft foot is now checked and corrected and the alignment operation can now continue.

8 Press PLUS and MINUS simultaniously to leave the soft foot mode and enter the measuring sequence.

LIMITED ROTATION

In some applications, it is not possible to rotate the measuring units to the 9 or 3 o'clock position because of limited space around the shaft coupling. However there is still a possibility to perform the alignment as long as the measuring units can rotate 180°.

When you have limited rotation possibilities the measurement points can be registered in other positions than 9 or 3.

All preparations are made as usual.

Measurement point registration

9 The display unit indicates that the measuring units should be placed in the 9 o'clock position.

Rotate the TD-units to another start position than 9 o'clock, in our example 11 o'clock.

Confirm the measurement by pressing the NEXT button.

3 The display unit indicates that the measuring units should be placed in the 3 o'clock position.

Rotate the shafts by 180°, in our example to 5 o'clock.

Confirm the measurement by pressing the NEXT button.

Proceed with the alignment as usual.

TOLERANCE TABLE

Tolerance Table - Metric

rpm	mm /100 mm	mm
0 - 1000	0.10	0.13
1000 - 2000	0.08	0.10
2000 - 3000	0.07	0.07
3000 - 4000	0.06	0.05
4000 - 6000	0.05	0.03

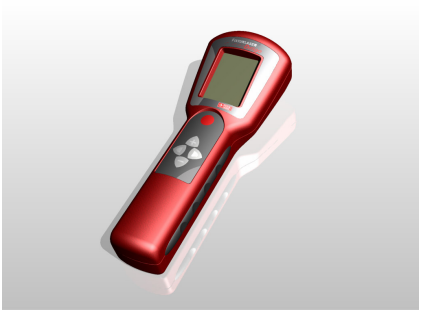
Tolerance Table - Imperial

rpm	mils / 1”	mils
3600	0.5	2.0
1800	0.7	4.0
1200	1.0	6.0
900	1.5	8.0

PRODUCT INFORMATION

DISPLAY UNIT
PART NO: 1-0725

Display unit with LCD display.

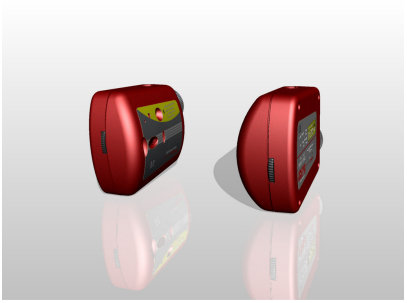


Technical specification

Display type	LCD 35 x 48 mm
Housing material	ABS plastic
Environmental temperature	0°C to +40°C
Power supply	2 x LR 14 (1.5V) alkaline batteries
Operating time	20 hours continious operation
Displayed resolution	0.01 mm (0.1 mil in inch mode)
Dimensions	230 x 81 x 62 mm
Weight	300 g

Transmitter/Detector units, TD-M & TD-S Part no: 1-0724, 1-0725

Unit with laser transmitter of diode type and detector.



Technical specification

Laser class	Class 2
Measuring distance	70 – 850 mm (2.7 inch – 2.8 feet)
Detector area	8.5 x 0.9 mm
Light stabilization	No interference from ambient light
Housing material	ABS Plastic
Environmental temperature	0°C to +40°C
Power supply	Powered from DU
Dimensions	87 x 79 x 39 mm
Weight	210 g

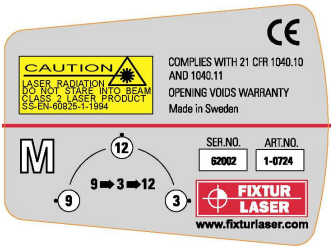
COMPLETE SYSTEM

Technical specification

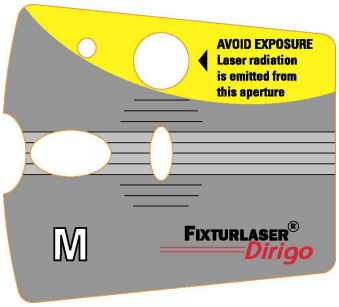
Shaft diameter range	30 – 500 mm (1.2 – 20 inch)
Accuracy of system	<2% +/-0.01 mm

WARNING LABELS

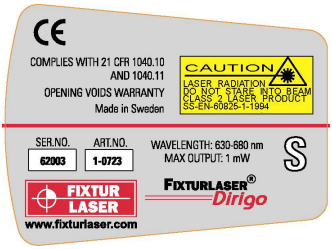
TD-M unit, rear



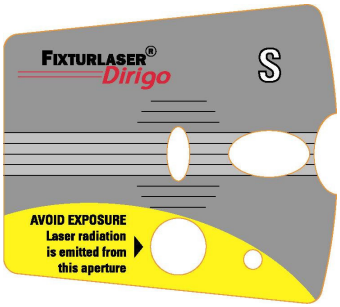
TD-M unit, front



TD-S unit, rear



TD-S unit, front



WARRANTY REGISTRATION CARD

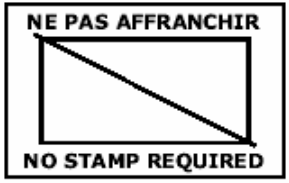
Product	Serial no.	Product	Serial no.
DU	#		#
TD-M	#		#
TD-S	#		#
T-	#		#
R-	#		#

Company	
Address	
City	
Zip Code	
Country	
Phone	
Fax	
User name(s)	

Industry

☐ Pulp & Paper	☐ Shipping/Marine
☐ Petroleum	☐ Machine tool
☐ Chemical	☐ Maintenance & Service
☐ Power production	☐ Other.....

Purchased from	
Date of purchase	



REPLY PAID / REPONSE PAYEE
SWEDEN / SUEDE

FIXTURLASER AB

SE-431 20 MÖLNDAL

SWEDEN

FIXTURLASER® Dirigo

Alignment Documentation

3 Horizontal result

Fill the correct symbol

F1

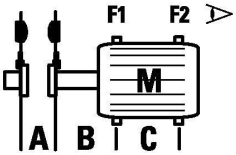
F2

12 Vertical result

Fill the correct symbol

F1

F2



rpm

A

B

C

8

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